

Standardism Performance of Dental Workers and Infection Control Status of Corrective Patient Instruments

Hee Ja Na*

Abstract

Objective: This study aims to understand the performance of standardism through the performance of orthodontic workers and the infection control of orthodontic patients, and to contribute to the improvement of oral health of orthodontic patients and provide it as academic basic data.

Methods: A study was conducted on 111 dental workers working at dental clinics in Gwangju Metropolitan City and Gyeonggi-do from March 1, 2023. The number of students participating in the study was calculated as the G. power 3.1 program, with an effect size of 0.3, a significant level of 0.05, and a power of 0.95. Participants in the survey understood the purpose of the study and agreed to participate in the study, and a self-written survey was conducted. The questionnaire was measured on a Likert 5-point scale, and 5 points were given to "very important" on the Likert 5-point scale and 1 point to "not important" so the higher the score, the higher the degree of practice.

Results: Number of sterilizations of braces * In cross-analysis of clinical experience, sterilization was most common once a week, followed by sterilization once every two weeks. It can be said that there is no significant difference in the number of times and clinical experience.

Conclusion: Clinical experience and regression analysis of instrument sterilization showed minimal levels of clinical experience, contaminated instrument management, hand hygiene, personal protective equipment, respiratory etiquette, and instrument sterilization methods.

Keywords: Dental workers; Standardism performance; Orthodontic patients; Instruments; Infection control; Sterilization; Personal protective equipment.

Introduction

Medical-related infections include various types of infections, including multidrug-

resistant bacterial infections, surgical site infections, and instrument-related infections, as well as increased morbidity and mortality, as well as public health issues

Deputy Professor, Department of Dental Hygiene, Honam University School of Health, and Science, Gwangsan-gu, Gwangju, Republic of Korea

*Corresponding Author: Hee Ja Na, Deputy Professor, Department of Dental Hygiene, Honam University School of Health, and Science, Gwangsan-gu, Gwangju, Republic of Korea.

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that cause extended hospital stay, increased medical costs, and permanent damage to the body [1]. Medical workers treated by patients with various infectious diseases in medical institutions are likely to be exposed to infectious sources held by patients during the treatment and nursing of these patients [2]. Most infectious diseases have the property of infection, so they are likely to spread throughout the group [3]. In 1996, the Centers for Disease Control and Prevention declared standardism as a precautionary measure to protect medical personnel from infection, and in 2007, revised standardism was announced that emphasized respiratory etiquette, administration of injections and contaminated needles, wearing masks during lumbar puncture procedures, and blocking pathogen transmission [4].

Standardism includes hand hygiene, personal protective equipment, respiratory etiquette, patient placement, patient care instruments and supplies, environmental management, lean and safe injection, infection control, staff safety, and applicable regulations for a lumbar puncture to protect outsiders and other patients [5]. Nurses and dental hygienists, who have the most outside contact with patients among medical workers, can reduce the risk of infection by performing appropriate infection control, but on the contrary, it can be a channel for infection. Therefore, it should play an important role in the prevention and management of medical-related infections for nurses or dental hygienists, patients, and carers [6]. In July 2006, the Ministry of Health and Welfare established anti-infection standards for dental hospitals and provided guidelines for disinfection and sterilization of dental materials and equipment used in the clinic to prevent cross-infection between patients

or between patients and medical staff. According to the infection prevention standards set by the Ministry of Health and Welfare, in order to sterilize the used equipment, it is necessary to clean, disinfect and sterilize it using appropriate packaging, cotton products, or containers, and write down the sterilization date. In addition, if the packaging is damaged, the sterilized equipment should be re-cleaned, packaged, and then sterilized and stored. The Korean Dental Infection Control Association is striving to prevent infection in dental medical institutions, such as education related to dental infection and the publication of newsletters related to dental infection.

In a study on priorities between dental staff and dental user groups, infection control was prioritized when both the medical quality and kindness services were the same, followed by medical expenses and pain consideration. In the case of dental users, medical expenses were prioritized, followed by infection control and pain consideration, so it has been reported that infection control is prioritized when choosing a dentist [7,8]. This study aims to increase the success rate of orthodontic treatment by determining whether dental workers comply with disinfection sterilization after treating instruments handled by orthodontic patients and dental workers. The limitation of this study is that the study was conducted in limited places in some areas, and in the future, the study will be flooded nationwide to prepare a manual based on infection control of orthodontic patients and dental workers.

Materials and methods

From March 1 to March 30, 2023, a study was conducted on 111 dental workers working at dental clinics in Gwangju Metropolitan City

and Gyeonggi-do. The number of students participating in the study was 31. G. power 3.1 program, with an effect size of 0.3, a significant level of 0.05, and a power of 0.95, and 111 students were calculated. Participants in the survey understood the purpose of the study and agreed to participate in the study, and a self-written survey was conducted. This study was conducted with the consent of IRB (NO 1041223-201912-HR-18) at Honam University's Bio-Science Ethics Committee. The questionnaire was measured on a Likert 5-point scale, and 5 points were given to "very important" on the Likert 5-point scale and 1 point to "not important" so the higher the score, the higher the degree of practice.

Research tool

Standardism performance and orthodontic patient equipment (non-risk equipment infection control) management. The standardism guidelines of the US CDC revised in 2007 [9] were used by Hong Sun-young, et al. [10]. The content of the questionnaire consists of a total of 8 sub-areas: 1 question in the hand hygiene area, 1 question in the personal protective equipment area, 1 question in the respiratory etiquette area, 2 questions in the treatment equipment and goods area, and 1 question in the employee safety area. Each question is a 5-point Likert scale of 1 point for "not important at all" and 5 points for "very important," meaning that the higher the score, the higher the performance of standardism. In this study, Cronbach's $\alpha = 0.70$.

Analysis method

The data collected in this study were analyzed using the SPSS 21.0 program.

The average and standard deviation were calculated. *Cross-analysis of clinical experience, one-way analysis of age and personal protection, sterilization of personal protection, number of sterilizations, sterilization of calibration apparatus, gender, age correlation, and regression analysis of clinical experience and sterilization were set to 95% confidence intervals.

In general, the average and standard deviation of the age was 2.144 (1.102), the average and standard deviation of gender was 1.108 (1.311), the average and standard deviation of marriage was 1.790 (1.407), the average and standard deviation of clinical experience was 2.324 (1.207), and the average and standard deviation of infection control education was 1.081 (1.274) (Table 1).

In the cross-analysis of the number of sterilizations of correctional instruments*clinical experience, the frequency of sterilization of correctional instruments*no is 18.0% with 20, the frequency of sterilization of correctional instruments*once a week is 27.9%, the frequency of correctional instruments*three times a week is 25.

In other words, sterilization once a week was the highest, followed by sterilization once every two weeks. It can be said that there is no significant difference between the number of times and clinical experience.

X₂ showed no significant difference in the number of sterilizations of correctional instruments*clinical experience at 11.549, significance probability 0.774, and significance level 0.05 (Table 2).

Results

Technical statistics	N	Minimum	Maximum	Mean	SD
Age	111	1	5	2.144	1.102
Gender	111	1	2	1.108	0.311
Marriage status	111	1	2	1.79	0.407
Clinical experience	111	1	5	2.324	1.207
Infection control education status	111	1	2	1.081	0.274
Valid N (by list)	111				

Table 1: General (n=111).

Cross Analysis	Full clinical experience		1~2years	3~4years	5~6years	7~8years	9~10Years	전체
The frequency of orthodontic instrument sterilization	No	Frequency	8	7	2	1	2	20
		Clinical experience %	25.80%	17.10%	10.00%	10.00%	22.20%	18.00%
	Once a week	Frequency	9	16	4	1	1	31
		Clinical experience %	29.00%	39.00%	20.00%	10.00%	11.10%	27.90%
	Twice a week	Frequency	6	6	6	4	3	25
		Clinical experience %	19.40%	14.60%	30.00%	40.00%	33.30%	22.50%
	Three times a week	Frequency	4	6	4	2	2	18
		Clinical experience %	12.90%	14.60%	20.00%	20.00%	22.20%	16.20%
	Every day	Frequency	4	6	4	2	1	17
		Clinical experience %	12.90%	14.60%	20.00%	20.00%	11.10%	15.30%
	Full	Frequency	31	41	20	10	9	111
		Clinical experience %	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Table 2: Number of sterilizations of calibration instruments. * Cross-analysis of clinical experience- (n=111).

In the one-way layout analysis for age and personal protective equipment, the mean and standard deviation of the 20s is 4.916 (0.5000), the mean and standard deviation of 30s are 4.780 (0.689), the mean and standard deviation of 40s are 4.681 (0.893), the mean and standard deviation of 50s are 3.666 (2.065), and the mean and standard deviation of 60s are 3.833(1.34). The F statistics of this group are 4.124, significance probability 0.004, and significance level 0.05, and there is a significant difference between age and personal protection implementation (Table 3).

The number of sterilizations of orthodontic instruments*The correlation coefficient of dental instruments sterilization is 0.485^{**}, and the method of sterilization of orthodontic instruments*Dental instruments is 0.282^{**}, showing a positive correlation 0.204^{*}, Age* For personal protective gear-. It has a negative correlation of 319^{**} (Table 4).

In the regression analysis of clinical experience and orthodontic sterilization, the F statistic is 0.135, significant probability of 0.876, which is not significant at the significance level of 0.05 (t=-0.157, p=0.876). Clinical experience, contaminated instrument management, hand hygiene, personal protective equipment, respiratory tract etiquette, and orthodontic instrument sterilization methods were all insignificant. However, the F statistics of clinical experience and the number of sterilizations of calibration instruments are 0.135, and the significant probability is 0.048, which is significantly explained at the significance level of 0.05 (t=-2.000, p=0.048).

84% of the total change (22% according to the modification coefficient) is explained by

clinical experience. In other words, the clinical experience and the number of sterilizations of correctional instruments are significant (Table 5).

Discussion

Since medical institutions have direct contact with patients, hygiene management must be thorough [11,12]. Patients and medical personnel are also exposed to infectious diseases. Dental clinics sterilize equipment by performing high-pressure steam sterilization as a way to prevent infection of these diseases. It may be safe to say that the instrument has been sterilized, but in order to establish a safer medical environment, it is necessary to check the validity period of the instrument that has already been sterilized. Previous studies on the validity period of sterilized products so far have had difficulty in setting the validity period of sterilized products due to differences in the validity period of sterilized products between studies.

Studies on the validity period of sterilization have shown that the validity period can be extended, and in Korea, some general hospitals have extended the validity period of sterilization after conducting a study on the validity period of sterilized products [13].

In this study, the correlation coefficient of sterilization of calibration instruments*the number of sterilizations of calibration instruments*the method of sterilization of calibration instruments*the sterilization of calibration instruments is 0.282^{**}, showing a positive correlation, and the number of sterilizations of personal protective devices is -0.204^{*}, Age* For personal protective gear -. It has a negative correlation of 319^{**} (Table 4).

Technical Statistics and ANOVA										
		N	Mean	SD	Sum of squares		Freedom degrees	Mean squared	F	P
Personal protective gear	20s	36	4.916	0.5	group-to-group	12.872	4	3.218	4.124	0.004
	30s	41	4.78	0.689	Group-My	82.714	106	0.78		
	40s	22	4.681	0.893	Total	95.586	110			
	50s	6	3.666	2.065						
	60s	6	3.833	1.834						
	Total	111	4.693	0.932						

Table 3: One-way layout analysis of age and personal protection-(n=111).

		Sterilization of orthodontic instruments	For personal protection	Number of sterilizations of orthodontic instruments	How to sterilize orthodontic appliances	age
Sterilization of orthodontic instruments	Pearson	1				
For personal protection	Pearson		1			
Number of sterilizations of orthodontic instruments	Pearson	.485**	-.204*	1		
How to sterilize orthodontic appliances	Pearson	.282**			1	
age	Pearson		-.319**			1
** Correlation is significant at 0.01 level (both sides)						
* Correlation is significant at 0.05 level (both sides)						

Table 4: Correlation analysis of orthodontics sterilization, personal protective attachment, number of orthodontics sterilization, method of orthodontics sterilization, gender, and age- (N=111)** . Correlation is significant at 0.01 level (both sides)*; Correlation is significant at 0.05 level (both sides).

Count a						
Model		Non-Standardized Coefficient		Standardized Coefficient	t	p
B			Standardization Error Beta	β		
1	(constant)	2.554	0.99		2.579	0.011
	Sterilization of orthodontics	-0.016	0.104	-0.018	-0.157	0.876
	Contaminated equipment management	-0.108	0.094	-0.118	-1.15	0.253
	Hand hygiene	-0.088	0.113	-0.075	-0.782	0.436
	for personal protection	0.095	0.125	0.073	0.754	0.452
	Ticket to the respiratory system	-0.175	0.111	-0.156	-1.584	0.116
	Number of sterilizations of orthodontic instruments	0.211	0.105	0.232	2	0.048
	How to sterilize orthodontics	0.178	0.168	0.108	1.059	0.292

Table 5: Regression analysis between clinical experience and orthodontic sterilization-(N=111); a. Dependent variable: clinical experience; R₂ (adj, R₂) =84(22), F =0.135.

In a study related to microbial contamination of instruments, Yoo [14] said that in order to reduce the possibility of microbial contamination, both nail workers and customers must use disinfected tools as well as wash their hands to be safe from infection. In this study, the mean and standard deviation of the 20s is 4.916(.5000), the mean and standard deviation of 30s are 4.780(.689), the mean and standard deviation of the 40s are 4.681(.893), the mean and standard deviation of 50s are 3.666(2.065), and the mean and standard deviation of 60s are 3.83334.

There is a significant difference in age and personal protective gear wear at 4.124, significance probability 0.004, and significance level 0.05 (Table 3). Previous studies have reported that the importance of cleaning is sometimes overlooked before disinfection and sterilization and that the effectiveness of intervention activities is proven through more precise experimental studies and that research on the development of guidelines is needed [15]. In the regression analysis of clinical experience and orthodontic sterilization in this study, the F statistic is .135, significant probability of 0.876, which is not significant at the significance level of 0.05 ($t=-0.157$, $p=0.876$). Clinical experience, contaminated instrument management, hand hygiene, personal protective equipment, respiratory tract etiquette, and orthodontic instrument sterilization methods were all insignificant. However, the F statistics of clinical experience and the number of Sterilization of calibration instruments are 0.135, and the significant probability is 0.048, which is significantly explained at the significance level of .05 ($t=-2.000$, $p=.048$). And 84% of the total change (22% according to the modification coefficient) is explained by clinical experience. In other words, clinical

experience and the number of sterilizations of calibration instruments are significant (Table 5). The highest performance in the sub-factor of standardism performance was in the treatment instrument and commodity areas, similar to the lowest performance in previous studies [16].

Hand hygiene should be performed after contact with blood, body fluids, excrement, mucous membranes, damaged skin wound dressings, hand hygiene should be performed if contact is made by moving from a contaminated body part of a patient to a clean body part, and hand hygiene should be performed before wearing gloves. Personal protective equipment should wear gloves before contacting the patient's blood, body fluids, mucous membranes, and damaged skin. Gloves should be replaced after contact with contaminated areas in one patient before contact with clean areas.

In addition, tickets for respiratory organs should be exchanged if they come into contact with one patient and then contacted with another patient, and isolation gowns should be worn if there is a risk of blood, body fluids, secretions, or excrement splashing. Masks and eye protection should be worn when blood, body fluids, and secretions are likely to splatter. Treatment instruments, environmental care, linen, and safe injection should be disposed of in a container dedicated to damaging waste and personal protective equipment should be worn when handling contaminated instruments and equipment.

The environment around the patient, i.e., the floor and bed of the hospital room, should be cleaned and disinfected if contamination is severe. Employee safety should treat laundry contaminated with blood, body fluids, excrement, and

secretions separately from general laundry. Be careful not to let used laundry touch the skin or mucous membranes. Be careful not to get poked when handling needles or sharp instruments.

Dentists handle the wire loop bent or straightened, or the equipment used to bend is a Wingart utility plier, Matthew plier, Ting plier, Young's plier, Tweed-roof banding plier, Bird-big plier, Light wire plier, 3Jo plier, plier, etc. When tying brackets to wires, or holding pliers. Tools for cutting wires include wire cutters, ligation cutters, and distal-end cutters that finish wires at the innermost and tip of teeth [17-19]. In this study, the frequency of sterilization of correction instruments * no in cross-analysis of clinical experience is 20 people, 18.0%, and the frequency of correction instruments * once a week is 27.5% of sterilization instruments. In other words, sterilization once a week was the highest, followed by sterilization once every two weeks.

It can be said that there is no significant difference between the number of times and clinical experience. X₂ showed no significant difference in the number of sterilization of braces * clinical history at 11.549, significance probability .774, and significance level .05. The Korean Dentist Association also published guidelines on classification and infection control methods according to disinfection and sterilization of dental equipment [20]. The orthodontic treatment instruments, which are the subjects of this study, are classified as non-risk instruments. Non-hazardous devices are devices that do not penetrate the patient's soft tissue and hard tissue or come into contact with the patient's healthy skin or indirect contact with the patient. The risk of infection transmission by this non-risk

instrument is lower than that of other instruments.

However, equipment that does not come into contact with the patient's mucous membrane can also be contaminated in various ways, such as by contact with the patient's oral cavity, contaminated gloves, and contaminated instruments or materials that entered the patient's mouth during dental treatment [21]. The limitation of this study is that the sample of the study subjects is limited to some provinces, and the number is small, so there is a limit to generalizing the research results.

Conclusion

This study was conducted on 111 dental workers working at dental clinics in Gwangju Metropolitan City and Gyeonggi-do from March 1 to March 30, 2023. The number of students participating in the study was G.power 3.1 program, with an effect size of 0.3, a significant level of 0.05, and a power of 0.95, and 111 students were calculated.

Participants in the survey understood the purpose of the study and agreed to participate in the study, and a self-written survey was conducted. The questionnaire was measured on a Likert 5-point scale, and 5 points were given to "very important" on the Likert 5-point scale and 1 point to "not important" so the higher the score, the higher the degree of practice.

1. In general, the average and standard deviation of the age was 2.144 (1.102), the average and standard deviation of gender was 1.108 (1.311), the average and standard deviation of marriage was 1.790 (1.407), the average and standard deviation of

- clinical experience was 2.324 (1.207), and the average and standard deviation of infection control education was 1.081 (1.274) (Table 1).
2. In other words, sterilization once a week was the highest, followed by sterilization once every two weeks. It can be said that there is no significant difference between the number of times and clinical experience. X² showed no significant difference in the number of Sterilization of correction instruments *clinical experience at 11.549, significance probability 0.774, and significance level 0.05 (Table 2).
 3. In the one-way layout analysis for age and personal protective equipment, the mean and standard deviation of the 20s is 4.916 (.5000), the mean and standard deviation of 30s are 4.780 (.689), the mean and standard deviation of 40s are 4.681 (.893), the mean and standard deviation of 50s are 3.666 (2.065), and the mean and standard deviation of 60s are 3.833(1.34). The F statistics of this group are 4.124, significance probability 0.004, and significance level 0.05, and there is a significant difference between age and personal protection implementation (Table 3).
 4. The number of Sterilization of orthodontic instruments*The correlation coefficient of dental instruments sterilization is 0.485^{**}, and the method of sterilization of orthodontic

instruments*Dental instruments is .282^{**}, showing positive correlation 0.204^{*}, Age* For personal protective gear -. It has a negative correlation of 319^{**} (Table 4).

5. In the regression analysis of clinical experience and orthodontic sterilization, the F statistic is .135, significant probability of 0.876, which is not significant at the significance level of 0.05 (t=-0.157, p=.876). Clinical experience, contaminated instrument management, hand hygiene, personal protective equipment, respiratory tract etiquette, and orthodontic instrument sterilization methods were all insignificant.

However, the F statistics of clinical experience and the number of Sterilization of calibration instruments are 0.135, and the significant probability is 0.048, which is significantly explained at the significance level of 0.05 (t=-2.000, p=.048) and 84% of the total change (22% according to the modification coefficient) is explained by clinical experience. In other words, the clinical experience and the number of Sterilization of correctional instruments are significant (Table 5).

Clinical relevance

Scientific basis for research

Clinical experience, contaminated instrument management, hand hygiene, personal protective equipment, respiratory etiquette, and methods of sterilization of corrective instruments were all insignificant.

The main result

People with a lot of clinical experience observe the sterilization of corrective equipment.

Conflict of interest

The author declares that there is no conflict of interest.

Author contribution

The author approved the final version of this manuscript prior to submission and agreed to be responsible for all aspects of the work ensuring that questions relating to

the accuracy or integrity of all parts of the work are properly addressed and resolved. NHJ contributed to design, search and selection, analysis and interpretation, drafted manuscripts, contributed to concepts and design, search and selection, analysis and interpretation, and critically modified manuscripts. The NHJ contributed to the concept, design, analysis, and interpretation, and critically modified the manuscript.

Data availability statement

Research data is not shared.

References

1. Carrico R. APIC text of infection control and epidemiology (3rd ed.). Washington, DC: Association for Professionals in Infection Control.
2. Jin-Hee P, Joung-A S. Seroprevalence of Anti-Hepatitis B Virus, Anti-Hepatitis A Virus, and Anti-Varicella Zoster Virus Antibodies in Nursing Students from 2009 to 2013. *Korean J Nosocomial Infect Control*. 2016;21(1):31-6.
3. Jin-Hong Y. The Recent Trend and Perspective of Infection Control in the Republic of Korea. *Korean J Nosocomial Infect Control*. 2016;21(1):1-8.
4. Jung SY. How to Prevent Transmission of Infectious Agents in Healthcare Settings. *Hanyang Med Rev*. 2011;31(3):190-9.
5. Siegel JD, Rhinehart E, Jackson M, Chiarello L. 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. 2007.
6. June KJ, Choi E. Infection control of hospital nurses: Cases of middle east respiratory syndrome. *Korean J Occup Health Nurs*. 2016;25(1):1-8.
7. Sim HN. A Study on Dental Staff's Perception of Infection Management at the Dental Treatment Rooms Master's thesis. Seoul Univ of Kyung Hee. 2009.
8. Dagher J, Sfeir C, Abdallah A, Majzoub Z. Infection Control Measures in Private Dental Clinics in Lebanon. *Int J Dent*. 2017;2017. [PubMed](#) | [CrossRef](#)
9. Weber DJ, Sickbert-Bennett EE, Brown VM, Brooks RH, Kittrell IP, et al. Compliance with Isolation Precautions at A University Hospital. *Infect Control Hosp Epidemiol*. 2007;28(3):358-61. [PubMed](#) | [CrossRef](#)
10. Hong SY, Kwon Y S, Park H. Recognition and performance of nursing college students on hospital infection control standardism. *J Korean Soc Nurs Educ*. 2012;18(2):293-302.
11. Powers D, Armellino D, Dolansky M, Fitzpatrick J. Factors Influencing Nurse Compliance with Standard Precautions *Am J Infect Control*. 2016;44(1):4-7. [PubMed](#) | [CrossRef](#)
12. Suliman M, Aloush S, Aljezawi M, AlBashtawy M. Knowledge and Practices of Isolation Precautions Among Nurses in Jordan. *Am J Infect Control*. 2018;46(6):680-4. [PubMed](#) | [CrossRef](#)
13. Na JG, Park HR, Sung HL, Song IH, Joo JH, et al. Convergence Study on Sterilized Dental Instruments Expiration Date. *J Korea Conv Soc*. 2018;9(12):129-35.
14. Yoo SH. Real State of Cognition for Safety and Hygiene in Nail Salon, and Analysis of Nail Treatment Tools Contaminated with Microorganisms. Master's degree Seokyeong University. 2011.
15. Noh EJ. Effect of Interventions for the Management of Steam Sterilizers and Sterilized Items in Out-Patient Clinics & Clinical Laboratories. Master's thesis Ulsan Ulsan University. 2009.

16. Hong SY, Kwon YS, Park HO. Nursing Students' Awareness and Performance on Standard Precautions of Infection Control in the Hospital. *J Korean Acad Soc Nurs Educ* 2012;18(2):293-302.
17. Na H J. Infection Control by Dental Hygienists: A Comparative Study on the Performance of Standard. *Sun Text Rev Dental Sci.* 2022;3(1):155.
18. Centers for Disease Control and Prevention. CDC/NHSN Surveillance Definitions for Specific Types of Infections.
19. Lee J S. The Effect of Heat Treatment on Elasticity and Phase Transition Behavior of Orthodontic Niti Alloy Wires. Yonsei University Graduate School: PhD Thesis in Dentistry. 1997.
20. Korean Dental Association (KDA). Infection control procedure in dental office. 2019.
21. Cha SR, Kim KJ. Protocol for Disinfection and Sterilization in Dental Clinic. *J Korean Dent Assoc.* 2013;51(3):130-7.